

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte WON BANG, CHEN-AN CHEN,
SHANKAR VENKATARAMAN,
and AJAY BHATNAGAR

Appeal 2007-0949
Application 10/081,312
Technology Center 1700

Decided: July 31, 2007

Before EDWARD C. KIMLIN, BRADLEY R. GARRIS, and
CHARLES F. WARREN, *Administrative Patent Judges*.

GARRIS, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal the final rejection of claims 1-12, 14-15, and 18-19 under 35 U.S.C. § 134. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM.

INTRODUCTION

Appellants claim a method of forming a coated part that reduces corrosion of the coated part (claim 1). The method includes coating a component part with magnesium fluoride such that the magnesium fluoride coating has a density of at least about 85% and a purity of at least about 99% (claim 1). The coated part finds particular use in a corrosive environment, such as found in semiconductor wafer processing (Specification ¶ [0002]).

Claims 1, 2, 9 and 14 are illustrative:

1. A method of forming a coated part, comprising the step of:

coating a component part with magnesium fluoride; wherein said magnesium fluoride coating has a density of at least about 85% and a purity of at least about 99%, and said coating reduces corrosion of said component part upon exposure to a corrosive environment.
2. The method of claim 1, wherein said magnesium fluoride coating has a density of between about 85-90%.
9. The method of claim 2, further comprising the step of annealing said coating at a temperature of at least about 600°C.
14. The method of claim 12, wherein the coating step is performed in an inert atmosphere.

The Examiner relies on the following prior art references as evidence of unpatentability:

Tomita	US 4,637,684	Jan. 20, 1987
Kubota	US 5,643,483	Jul. 1, 1997
Toyoda (as translated)	JP 9-328382	Dec. 22, 1997
Kawamata	US 5,958,155	Sep. 28, 1999
Ohashi	US 6,139,983	Oct. 31, 2000
Morton	US 6,162,495	Dec. 19, 2000

Ohmi
Itoh

US 6,215,806 B1
US 6,287,683 B1

Apr. 10, 2001
Sep. 11, 2001

The rejections as presented by the Examiner are as follows:

1. Claims 1-7, 10-12, 18, and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Toyoda in view of Ohashi, Itoh, Tomita, and Morton.
2. Claim 8 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Kubota.
3. Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Ohmi.
4. Claims 14 and 15 are rejected under 35 U.S.C. § 103(a) over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Kawamata.
5. Claims 1, 3-6, 10, 11, 18 and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tomita in view of Morton.
6. Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Tomita in view of Morton and Itoh.
7. Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Tomita in view of Morton, Itoh, and Ohmi.

With regard to the rejections where Toyoda is the primary reference, Appellants separately argue claims 1, 8, 9, and 14. Accordingly, dependent claims 2-7, 10-12, 15, 18, and 19 stand or fall with these claims.

With regard to the rejections in which Tomita is the primary reference, Appellants separately argue claims 1, 2, and 9. Accordingly, dependent claims 3-6, 10, 11, 18, and 19 stand or fall with these claims.

OPINION

35 U.S.C. § 103(a) REJECTION OVER TOYODA IN VIEW OF OHASHI, ITOH, TOMITA AND MORTON

CLAIM 1

Appellants argue that none of the references discloses or suggests a method of forming a magnesium fluoride coating having “a density of at least about 85% and a purity of at least about 99%” (Br. 4-6). Appellants further argue that it would not have been obvious to one of ordinary skill in the art to optimize the temperature and pressure of the magnesium fluoride deposition process (Br. 6). Specifically, Appellants argue that Ohashi uses a higher pressure (i.e, 5.25×10^{-3} to 3.75×10^{-2} torr) to deposit a magnesium fluoride coating free of pinholes and defects (Br. 6) such that there would have been no reason to lower the pressure to 1×10^{-6} torr as disclosed by Morton to achieve a coating free of pinholes or defects (Br. 7). Appellants further contend that the Examiner used impermissible hindsight in selecting “a density at least about 85%” as the threshold density that the coating of the references would have or be trying to obtain (Reply Br. 3).

We have considered all of Appellants’ arguments and find them unpersuasive for the reasons below.

The question to be answered when assessing the obviousness of a claimed invention reciting a combination of prior art elements is whether the

improvement is more than the predictable use of the prior art elements according to their established functions. *KSR Int'l Inc. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (2007). If a person of ordinary skill can implement a predictable variation of the prior art, § 103 likely bars its patentability. *Id.* In many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle. *KSR*, 127 S. Ct. at 1742, 82 USPQ2d at 1397. Generally, it would have been obvious for an artisan with ordinary skill to develop workable or even optimum ranges for art-recognized, result-effective parameters. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936-1937 (Fed. Cir. 1990); *In re Boesch*, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980); *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

In the present case, the Examiner does not dispute that the claimed density and purity are not disclosed by the prior art (Answer 19). Rather, the Examiner maintains that the disclosures of the prior art, taken as a whole, are such that the claimed density and purity would have been obvious (Answer 19). We agree.

The Examiner sets-forth the disclosures of Toyoda, Ohashi, Itoh, Tomita, and Morton relied upon in the body of the rejection of claims 1-7, 10-12, 18, and 19, and in the “Response to Arguments” section of the Answer (Answer 4-9 and 19-21). We adopt the Examiner’s presentation of the disclosures of the Toyoda, Ohashi, Itoh, Tomita, and Morton patents and his reasoning for combining the patents as our own and refer to them in our discussion of the § 103 rejection of claims 1-7, 10-12, 18, and 19 below.

As the Examiner indicates on pages 4-9 and 19-21 of the Answer, the Toyoda, Ohashi, Itoh, Tomita, and Morton disclosures would have suggested

combining their disclosures to arrive at the claimed invention. Specifically, Toyoda discloses a method of forming a magnesium fluoride coating on a semiconductor wafer holder or susceptor using a 99.5% pure magnesium fluoride target (Toyoda, ¶¶ [0003], [0004], [0012], [0014]; Answer 4). Ohashi discloses that pinholes and defects (e.g., changes in coating density¹) should be avoided when forming magnesium fluoride coatings on wafer-supporting members (Ohashi, col. 1, ll. 7-11; col. 6, ll. 15-27; Answer 5). Itoh discloses that the density of a magnesium fluoride coating may be manipulated by varying the pressure and temperature of coating application (Itoh, col. 5, ll. 7-21; Answer 5-6). Tomita and Morton disclose a temperature and pressure, respectively, for achieving a dense and pure magnesium fluoride coating (Tomita, col. 4, ll. 49-54; Morton, col. 3, ll. 48-66; Answer 6).

As is evident from the foregoing exposition of the various patent disclosures, these disclosures would have led one of ordinary skill in the art to piece together the teachings of the Toyoda, Ohashi, Itoh, Tomita, and Morton patents like “pieces of a puzzle.” *KSR*, 127 S. Ct. at 1742, 82 USPQ2d at 1397.

Moreover, the Examiner’s presentation of the § 103 rejection over Toyoda, Ohashi, Itoh, Tomita, and Morton on pages 4-9 and 19-21 of the Answer establishes that Appellants’ claimed invention only involves the “predictable use of prior art elements according to their established functions” to achieve a predictable result (i.e., a dense and pure magnesium

¹ A pinhole is considered a change in coating density because the density changes from that of the coating surrounding the pinhole to zero in the pinhole (i.e., there is no coating in the pinhole).

fluoride coating). *KSR*, 127 S. Ct. at 1741, 82 USPQ2d at 1396. Based on the exposition of the prior art disclosures provided in the above paragraphs, it would have been obvious for one of ordinary skill in the art to combine Tomita's temperature and Morton's pressure for forming a dense and pure magnesium fluoride coating with Toyoda's method of forming a magnesium fluoride coating in view of Itoh's recognition that increasing temperature and decreasing pressure predictably increase the density of the coating. *Id.* Additionally, the combination of Toyoda in view of Tomita, Morton, and Itoh is further supported by Ohashi's teaching to avoid pinholes and defects (i.e., changes in density) in the magnesium fluoride coating. In other words, as evinced by the Examiner's § 103(a) rejection set forth on pages 4-9 and 19-21 of the Answer, Appellants' claimed invention is merely the predictable use of prior art elements of temperature and pressure (i.e., increasing temperature and decreasing pressure as disclosed by Itoh) according to their established functions (i.e., to increase the density of the coating) to achieve a dense and pure magnesium fluoride coating. *KSR*, 127 S. Ct. at 1741, 82 USPQ2d at 1396.

We are unpersuaded by Appellants' argument that Ohashi uses a higher pressure (i.e., 5.25×10^{-3} to 3.75×10^{-2} torr) to deposit the magnesium fluoride coating free of pinholes and defects (Br. 6) such that there would have been no reason to lower the pressure to 1×10^{-6} torr as disclosed by Morton to achieve a coating free of pinholes or defects (Br. 7). As the Examiner indicated, the Itoh disclosure establishes that temperature and pressure are result-effective variables (Answer 6, 20-21). Accordingly, it would have been obvious to decrease the pressure to achieve a dense coating

as disclosed by Itoh and Morton (Itoh, col. 5, ll. 7-21; Morton, col. 3, ll. 48-66). *Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936-1937; *Boesch*, 617 F.2d at 276, 205 USPQ at 219; *Aller*, 220 F.2d at 456, 105 USPQ at 235.

Regarding Appellants' impermissible hindsight argument, our above discussion of the prior art disclosures demonstrates that temperature and pressure are result-effective variables. Accordingly, it would have been obvious to determine the optimum range of these variables to achieve the desired density, which reasonably includes a density of "at least about 85%." *Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936-1937; *Boesch*, 617 F.2d at 276, 205 USPQ at 219; *Aller*, 220 F.2d at 456, 105 USPQ at 235. Therefore, the Examiner has not used impermissible hindsight.

We affirm the Examiner's § 103(a) rejection of argued claim 1 and non-argued claims 2-7, 10-12, 18, and 19 over Toyoda in view of Ohashi, Itoh, Tomita, and Morton.

35 U.S.C. § 103(a) REJECTION OVER TOYODA IN VIEW OF OHASHI, ITOH, TOMITA, MORTON AND KUBOTA

DEPENDENT CLAIM 8

Appellants argue that Kubota does not disclose that the magnesium fluoride coating has a density of at least about 85% and a purity of at least about 99% as claimed (Br. 7).

We have considered Appellants' argument and find it unpersuasive for the reasons below.

Appellants do not contest that Kubota discloses the claimed surface finish of claim 18 or that Kubota's surface finish is combinable with the method of Toyoda in view of Ohashi, Itoh, Tomita, and Morton. Rather, Appellants argue that Kubota does not teach the claimed density and purity of the magnesium fluoride coating. However, as discussed above, the combination of Toyoda in view of Ohashi, Itoh, Tomita, and Morton would have rendered obvious the claimed purity and density of the coating.

Therefore, we affirm the Examiner's § 103(a) rejection of claim 8 over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Kubota.

35 U.S.C. § 103(a) REJECTION OVER TOYODA IN VIEW OF OHASHI, ITOH, TOMITA, MORTON. AND OHMI

DEPENDENT CLAIM 9

Appellants argue that Ohmi does not disclose that the magnesium fluoride coating has "a density of at least about 85% and a purity of at least about 99%" as claimed (Br. 8). Appellants further argue that Ohmi discloses that magnesium fluoride may be heated to a temperature of 150-450°C after it is formed, not 200-600°C as cited by the Examiner (Br. 8). Appellants contend that Ohmi discloses that the 200-600°C range is for iron fluoride, not magnesium fluoride (Br. 8).

We have considered all of Appellants' arguments and find them unpersuasive for the reasons below.

Appellants argue that Ohmi does not teach the claimed density and purity of the magnesium fluoride coating. However, as discussed above, the

combination of Toyoda in view of Ohashi, Itoh, Tomita, and Morton would have rendered obvious the claimed purity and density.

Furthermore, Appellants' argument regarding Ohmi's temperature range disclosure for magnesium fluoride (i.e., 150-450°C) is not persuasive. Ohmi discloses that a temperature range of 150-450°C is preferred for annealing magnesium fluoride coatings (Ohmi, col. 11, ll. 55-61). Ohmi, like Itoh, discloses that the density of the magnesium fluoride coating increases with the application of heat (Ohmi, col. 11, ll. 55-57). In other words, Ohmi, like Itoh, recognizes temperature (i.e, heat treatment) as a result-effective variable. Accordingly, it would have been obvious to optimize the temperature range for Ohmi's heat treatment to include a temperature of "at least about 600°C" as recited in claim 9 to achieve the desired density. *In re Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936-1937; *In re Boesch*, 617 F.2d at 276, 205 USPQ at 219; *In re Aller*, 220 F.2d at 456, 105 USPQ at 235.

Therefore, we affirm the Examiner's § 103(a) rejection of claim 9 over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Ohmi.

35 U.S.C. § 103(a) REJECTION OVER TOYODA IN VIEW OF OHASHI, ITOH, TOMITA, MORTON, AND KAWAMATA

DEPENDENT CLAIM 14

Appellants argue that Kawamata does not disclose that the magnesium fluoride coating has a density of at least about 85% and a purity of at least about 99% as claimed (Br. 9).

We have considered Appellants' argument and find it unpersuasive for the reasons below.

Appellants do not contest that Kawamata discloses performing the coating step in an inert atmosphere as recited in claim 14, or that Kawamata's performance of the coating in an inert atmosphere is combinable with the method of Toyoda in view of Ohashi, Itoh, Tomita, and Morton. Rather, Appellants argue that Kawamata does not teach the claimed density and purity of the magnesium fluoride coating. However, as discussed above, the combination of Toyoda in view of Ohashi, Itoh, Tomita, and Morton would have rendered obvious the claimed purity and density of the coating.

Therefore, we affirm the Examiner's § 103(a) rejection of argued claim 14 and non-argued claim 15 over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Kawamata.

35 U.S.C. § 103(a) REJECTION OVER TOMITA IN VIEW OF MORTON

CLAIM 1

Appellants argue there is no suggestion to combine Morton's low-pressure deposition method with Tomita's method of forming a magnesium fluoride coating (Br. 10). Appellants further argue that Tomita's evaporative process and Morton's physical vapor deposition (PVD) process use fundamentally different deposition techniques, process equipment, and process chemistries, such that an assertion that process parameters from an evaporative deposition process are suitable for a PVD process is

overreaching when made without support from the references or other extrinsic evidence (Reply Br. 3).

We have considered all of Appellants' arguments and find them unpersuasive for the reasons below.

As the Examiner states in the "Response to Arguments" section on pages 22-23 of the Answer, Tomita discloses forming a low porosity (i.e., high density) magnesium fluoride coating, but is silent regarding the exact density and purity of the coating, or the pressure used in the deposition method (Answer 23; Tomita, col. 4, ll. 49-54). Morton discloses that using a pressure of 1×10^{-6} torr or less produces a dense and pure magnesium fluoride coating (Answer 23; Morton, col. 3, ll. 48-66). Based on these disclosures, the Examiner properly concludes that it would have been obvious to combine Morton's pressure with Tomita's method of making a magnesium fluoride coating so as to produce a dense and pure magnesium fluoride coating as disclosed by Morton. Tomita's disclosure to form a low porosity (i.e., high density) coating provides motivation for using Morton's pressure that forms a dense and pure magnesium fluoride coating.

From the above disclosures, the Examiner properly determined (Answer 23) that the teachings of the prior art provide motivation for the combination. *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998).

We add that the combination of Tomita in view of Morton as discussed above demonstrates that Appellants' claimed invention is merely the predictable use of pressures and temperatures (i.e., prior art elements) as disclosed by Tomita and Morton to produce a dense and pure magnesium

fluoride coating (i.e., the established function of the prior art elements).
KSR, 127 S. Ct. at 1741, 82 USPQ2d at 1396.

Moreover, since the combined process of Tomita in view of Morton is the same as the process claimed by Appellants (claims 1, 5, and 6) (i.e., the same temperature and pressure are used), the magnesium fluoride coating (i.e., the product produced by the process) would be expected to have the same density and purity as claimed by Appellants. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977).

Appellants argue that evaporative and PVD processes are fundamentally different such that the Examiner's assertion that process parameters from an evaporative deposition process are suitable for a PVD process is overreaching when made without support from the references or other extrinsic evidence (Reply Br. 3). Contrary to Appellants' argument, as evinced by the definition of "physical vapor deposition," evaporative processes are a type of physical deposition.² Hence, PVD and evaporative processes are not fundamentally different as alleged by Appellants.

We affirm the Examiner's § 103(a) rejection of argued claim 1 and non-argued claims 3-6, 10, 11, 18, and 19 over Tomita in view of Morton.

35 U.S.C. § 103(a) REJECTION OVER TOMITA IN VIEW OF MORTON AND ITOH

CLAIM 2

Appellants argue that the mere fact Itoh discloses a mechanism by which one may adjust the density of a deposited film would have provided

² See *Kirk-Othmer Encyclopedia of Chemical Technology*, "Thin Films" 1041, 1044 (Mary Howe-Grant ed., 4th ed. 1997).

no motivation to alter the disclosed processes of another prior art reference (i.e., Tomita or Morton) (Br. 10). Appellants further argue that Tomita, Morton, or Itoh do not disclose a magnesium fluoride coating having “a density of at least about 85% and a purity of at least about 99%” (Br. 10-11).

We have considered all of Appellants’ arguments and find them unpersuasive for the reasons below.

Itoh describes that temperature and pressure are result-effective variables in determining the density of the magnesium fluoride coating (Itoh, col. 5, ll. 7-21). Specifically, Itoh discloses that a high temperature and low pressure produces a dense magnesium fluoride coating (Itoh, col. 5, ll. 10-14). Tomita discloses a suitable temperature for producing a low porosity (i.e., high density) magnesium fluoride coating (Tomita, col. 4, ll. 40-42, 49-54) and Morton discloses a pressure for achieving a “pure and dense” magnesium fluoride coating (Morton, col. 3, ll. 48-66).

It would have been obvious to combine and optimize Morton’s pressure and the temperature with Tomita’s method to achieve a pure and dense magnesium fluoride coating in view of Itoh’s disclosure that temperature and pressure are result-effective variables. *In re Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936-1937; *In re Boesch*, 617 F.2d at 276, 205 USPQ at 219; *In re Aller*, 220 F.2d at 456, 105 USPQ at 235.

We add that the combination of Tomita in view of Morton and Itoh as discussed above demonstrates that Appellants’ claimed invention is merely the predictable use of pressures and temperatures (i.e., prior art elements) to produce a dense and pure magnesium fluoride coating (i.e., the established function of these prior art elements). *KSR*, 127 S. Ct. at 1741, 82 USPQ2d at 1396.

Furthermore, since the claim 2 process and the process of Tomita in view of Morton and Itoh are identical, one would expect the density and purity of the magnesium fluoride coating of the combined prior art process to be the same as Appellants' claimed magnesium fluoride coating. *Best*, 562 F.2d at 1255, 195 USPQ at 433-34. Appellants bear the burden of showing that such density would not be achieved. *Id.* Appellants have not proffered any showing to satisfy their burden.

For the foregoing reasons, we affirm the Examiner's § 103(a) rejection of claim 2 over Tomita in view of Morton and Itoh.

35 U.S.C. § 103(a) REJECTION OVER TOMITA IN VIEW OF MORTON, ITOH AND OHMI

CLAIM 9

Appellants argue that Ohmi does not disclose that the magnesium fluoride coating has a density of at least about 85% and a purity of at least about 99% as claimed (Br. 11). Appellants also argue that Ohmi discloses that magnesium fluoride may be heated to a temperature of 150-450°C after it is formed, not 200-600°C as cited by the Examiner (Br. 11).

We have considered all of Appellants' arguments and find them unpersuasive for the reasons given below.

Regarding Appellants' argument that Ohmi does not teach the claimed density and purity of the magnesium fluoride coating, as discussed above, the claimed purity and density would have been rendered obvious by the combination of Tomita in view of Morton and Itoh.

Furthermore, Appellants' argument regarding Ohmi's temperature range disclosure for magnesium fluoride (i.e., 150-450°C) is not persuasive.

Ohmi discloses that a temperature range of 150-450°C is preferred for annealing magnesium fluoride coatings (Ohmi, col. 11, ll. 55-61). Ohmi, like Itoh, discloses that the density of the magnesium fluoride coating increases with the application of heat (Ohmi, col. 11, ll. 55-57). In other words, Ohmi, like Itoh, recognizes temperature (i.e, heat treatment) as a result-effective variable. Accordingly, it would have been obvious to optimize the temperature range for Ohmi's heat treatment to include a temperature of "at least about 600°C" as recited in claim 9 to achieve the desired density. *In re Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936-1937; *In re Boesch*, 617 F.2d at 276, 205 USPQ at 219; *In re Aller*, 220 F.2d at 456, 105 USPQ at 235.

Therefore, we affirm the Examiner's § 103(a) rejection of claim 9 over Tomita in view of Morton, Itoh and Ohmi.

DECISION

The Examiner's rejection of claims 1-7, 10-12, 18, and 19 under 35 U.S.C. § 103(a) as being unpatentable over Toyoda in view of Ohashi, Itoh, Tomita, and Morton is AFFIRMED.

The Examiner's rejection of claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Kubota is AFFIRMED.

The Examiner's rejection of claim 9 under 35 U.S.C. § 103(a) as being unpatentable over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Ohmi is AFFIRMED.

The Examiner's rejection of claims 14 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Toyoda in view of Ohashi, Itoh, Tomita, Morton, and Kawamata is AFFIRMED.

The Examiner's rejection of claims 1, 3-6, 10, 11, 18, and 19 under 35 U.S.C. § 103(a) as being unpatentable over Tomita in view of Morton is AFFIRMED.

The Examiner's rejection of claim 2 under 35 U.S.C. § 103(a) as being unpatentable over Tomita in view of Morton and Itoh is AFFIRMED.

The Examiner's rejection of claim 9 under 35 U.S.C. § 103(a) as being unpatentable over Tomita in view of Morton, Itoh, and Ohmi is AFFIRMED.

The decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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